

# Gia-Wei Chern

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## EDUCATION

- Ph.D. in Condensed Matter Physics, Johns Hopkins University, 2003–2008.  
Dissertation: *Magnetic Ordering in Frustrated Antiferromagnets on the Pyrochlore Lattice*.
- Ph.D. in Optoelectronics Engineering, National Taiwan University, 1996–2001.  
Dissertation: *Theoretical Modeling and Filter Design of Binary Waveguide Gratings*.
- B.S. in Electrical Engineering, National Taiwan University, 1992–1996.

**PERSONAL** Citizenship: Taiwan.

## RESEARCH EXPERIENCE

- J. Robert Oppenheimer Fellow, Los Alamos National Laboratory, 2012-present.
- ICAM Postdoctoral Fellow, U. Wisconsin-Madison/Los Alamos National Lab, 2010-2012.
- Postdoctoral Research Associate, University of Wisconsin-Madison, 2008-2010.
- Research Assistant, Johns Hopkins University, 2003-2008.
- Research Assistant, National Taiwan University, 1996-2003.

## PROFESSIONAL ACTIVITIES

- Visiting scientist, Max Planck Institute for Physics of Complex Systems, 2009–2012.
- Participant, PITP/Les Houches Summer School on *Quantum Magnetism*, June 2006.
- Visiting scientist, University of Florida, Gainesville, May 2002.

## FELLOWSHIPS AND AWARDS

- J. Robert Oppenheimer Fellowship, LANL 2012.
- Institute for Complex Adaptive Matter (ICAM) Postdoctoral Fellowship, 2010-2012.
- Krieger School of Arts and Sciences Teaching Award finalist, Johns Hopkins University, 2004.
- Donald E. Kerr and Barbara Stanley Fellowship, Johns Hopkins University, 2003–2004.
- Presidential Award, National Taiwan University, 1993.

## OTHER EXPERIENCE

- Technical Consultant at *Infamax Optical Technology Corporation*,  
<http://www.opto-infomax.com.tw>, Hsinchu City, Taiwan, 2001.
- Co-founder and Programming Engineer of *Eki Digital Technology Corporation*,  
<http://www.eki.com.tw>, Taipei, Taiwan, 1997.

## PATENTS

- U.S. Patent Number: 6734976, *Method and system for measuring an ultrashort optical pulse*, 2004.

## PROFESSIONAL MEMBERSHIP

- American Physical Society, Optical Society of America.

## PUBLICATION LIST

### A. Condensed matter physics:

1. **G.-W. Chern**, C. Reichhardt, and C. J. Olson Reichhardt, *Frustrated colloidal ordering and fully packed loops in arrays of optical traps*, arXiv:1302.2979 (2013).
2. E. Choi, **G.-W. Chern**, N. Perkins, *Chiral magnetism and helimagnons in a pyrochlore antiferromagnet*, Phys. Rev. B **87**, 054418 (2013); arXiv:1301.5958 (2013).
3. **G.-W. Chern**, A. Rahmani, I. Martin, C. D. Batista, *Quantum Hall ice*, arXiv:1212.3617 (2012).
4. N. Perkins, **G.-W. Chern**, and W. Brenig, *Raman scattering in a Heisenberg  $S = 1/2$  antiferromagnet on the anisotropic triangular lattice*, arXiv:1212.2286 (2012).
5. **G.-W. Chern**, M. J. Morrison, C. Nisoli, *Engineering degeneracy: a critical ground state for artificial spin ice*, arXiv:1210.8377 (2012).
6. **G.-W. Chern**, S. Maiti, R. M. Fernandes, and Peter Wölfle, *Electronic transport in the Coulomb phase of the pyrochlore spin ice*, arXiv:1210.3289 (2012).
7. **G.-W. Chern** and R. Moessner, *Dipolar order by disorder in the classical Heisenberg antiferromagnet on the kagome lattice*, Phys. Rev. Lett. **110**, 077201 (2013); arXiv:1207.4752 (2012).
8. E. Choi, **G.-W. Chern**, N. B. Perkins, *Helimagnons in a chiral ground state of pyrochlore antiferromagnets*, Europhys. Lett. **101**, 37004 (2013); arXiv:1205.4225 (2012).
9. **G.-W. Chern**, Congjun Wu, *Four-coloring model and frustrated superfluidity in the diamond lattice*, arXiv:1204.6019 (2012).
10. **G.-W. Chern**, C. D. Batista, *Spontaneous Quantum Hall effect via a thermally induced quadratic Fermi point*, Phys. Rev. Lett. **109** 156801 (2012); arXiv:1204.5737 (2012).
11. **G.-W. Chern**, R. M. Fernandes, R. Nandkishore, and A. V. Chubukov, *Broken translational symmetry in an emergent paramagnetic phase of graphene*, Phys. Rev. B **86** 115443 (2012); arXiv:1203.5776 (2012).
12. M. M. Altarawneh, **G.-W. Chern**, N. Harrison, C. D. Batista, A. Uchida, M. Jaime, D. G. Rickel, S. A. Crooker, C. H. Mielke, J. B. Betts, J. F. Mitchell, M. J. R. Hoch, *A cascade of magnetic field induced spin transitions in LaCoO<sub>3</sub>*, Phys. Rev. Lett. **109**, 037201 (2012); arXiv:1206.2603.
13. Y. Kato, **G.-W. Chern**, K. A. Al-Hassanieh, N. B. Perkins, C. D. Batista, *Orbital disorder induced by charge fluctuations in vanadium spinels*, Phys. Rev. Lett. **108**, 247215 (2012); arXiv:1205.1081 (2012).
14. R. Nandkishore, **G.-W. Chern**, A. V. Chubukov, *Itinerant half-metal spin-density-wave state on the hexagonal lattice*, Phys. Rev. Lett. **108**, 227204 (2012); arXiv:1202.2127 (2012).
15. **G.-W. Chern** and O. Tchernyshyov, *Magnetic charge and ordering in kagome spin ice*, Phil. Trans. Roy. Soc. A, special issue on magnetic monopoles; arXiv:1109.0275 (2011).
16. **G.-W. Chern** and Congjun Wu, *The orbital analog of ice: p-band Mott-insulators on the diamond lattice*, Phys. Rev. E **84**, 061127 (2011); arXiv:1104.1614 (2011). *Featured in the January 2012, issue of Virtual Journal of Atomic Quantum Fluids.*

17. **G.-W. Chern** and C. D. Batista, *Spin superstructure and noncoplanar ordering in metallic pyrochlore magnets with degenerate orbitals*, Phys. Rev. Lett. **107**, 186403 (2011); arXiv:1108.3066 (2011).
18. A. Nersesyan, **G.-W. Chern**, N. B. Perkins, *Quantum phase transitions in a strongly entangled spin-orbital chain: A field-theoretical approach*, Phys. Rev. B **83**, 205132 (2011); arXiv:1101.1268 (2011).
19. **G.-W. Chern**, P. Mellado, O. Tchernyshyov, *Two-stage ordering of spins in dipolar spin ice on the kagome lattice*, Phys. Rev. Lett. **106**, 207202 (2011); arXiv:0906.4781 (2009).
20. **G.-W. Chern**, *Noncoplanar magnetic ordering driven by itinerant electrons on the pyrochlore lattice*, Phys. Rev. Lett. **105**, 226403 (2010); arXiv:1007.5521 (2010).
21. **G.-W. Chern**, *Pyrochlore antiferromagnet with antisymmetric exchange interactions: critical behavior and order from disorder*, arXiv:1008.3038 (2010).
22. **G.-W. Chern**, N. B. Perkins, G. I. Japaridze, *Quantum criticality of vanadium chains with strong relativistic spin-orbit interaction*, Phys. Rev. B **82**, 172408 (2010); arXiv:1007.3472 (2010); Featured in the December 2010 issue of Virtual Journal of Quantum Information.
23. **G.-W. Chern**, N. Perkins, Z. Hao, *Quantum 120° model on pyrochlore lattice: orbital ordering in MnV<sub>2</sub>O<sub>4</sub>*, Phys. Rev. B **81**, 125127 (2010); arXiv:0912.5171 (2009).
24. **G.-W. Chern**, *Three-dimensional topological phases in a layered honeycomb spin-orbital model*, Phys. Rev. B **81**, 125134 (2010); arXiv:0912.4020 (2009).
25. D. Zhou, **G.-W. Chern**, J. Fei, Robert Joynt, *Topology of Entanglement Evolution of Two Qubits*, Int. J. Mod. Phys. B **26**, 1250054 (2012); arXiv:1007.1749 (2010).
26. O. Tchernyshyov, **G.-W. Chern**, *Spin-lattice coupling in antiferromagnetic spinels*, in *Introduction to Frustrated Magnetism*, edited by C. Lacroix, P. Mendels, and F. Mila, Springer Series in Solid State Sciences, Vol. **164** (Springer-Verlag, 2011); arXiv:0907.1693.
27. **G.-W. Chern**, N. Perkins, *Model for frustrated spin-orbital chains as applied to CaV<sub>2</sub>O<sub>4</sub>*, Phys. Rev. B **80**, 220405 (2009); arXiv:0907.3006.
28. **G.-W. Chern**, N. Perkins, *Large-J approach to strongly coupled spin-orbital systems*, Phys. Rev. B **80**, 180409(R) (2009); arXiv:0905.4728. Featured in the November 11, 2009, issue of Virtual Journal of Quantum Information.
29. **G.-W. Chern**, R. Moessner, O. Tchernyshyov, *Partial order from disorder in a classical pyrochlore antiferromagnet*, Phys. Rev. B **78**, 144418 (2008); arXiv:0803.2332. Selected as an Editors' Suggestion.
30. **G.-W. Chern**, D. Clarke, H. Youk, O. Tchernyshyov, *Halfvortices in flat nanomagnets*, in *Quantum Magnetism*, NATO Science for Peace and Security Series B: Physics and Biophysics (Springer-Verlag, 2008); arXiv:1007.2158.
31. D. J. Clarke, O. A. Tretiakov, **G.-W. Chern**, Ya. B. Bazaliy, O. Tchernyshyov, *Dynamics of a vortex domain wall in a magnetic nanostrip: an application of the collective coordinate approach*, Phys. Rev. B **78**, 134412 (2008); arXiv:0806.3283.
32. O. A. Tretiakov, D. Clarke, **G.-W. Chern**, Ya. B. Bazaliy, and O. Tchernyshyov, *Dynamics of domain walls in magnetic nanostrips*, Phys. Rev. Lett. **100**, 127204 (2008); arXiv:0705.4463. Featured in the March 28, 2008, issue of Virtual Journal of Nanoscale Science & Technology.

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34. **G.-W. Chern**, C. J. Fennie, O. Tchernyshyov, *Broken parity and a chiral ground state in the frustrated magnet  $CdCr_2O_4$* , Phys. Rev. B **74**, 060405(R) (2006); cond-mat/0606039.
35. H. Youk, **G.-W. Chern**, K. Merit, B. Oppenheimer, O. Tchernyshyov, *Composite domain walls in flat nanomagnets: the magnetostatic limit*, J. Appl. Phys. **99**, 08B101 (2006); cond-mat/0508741.
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37. F. Q. Zhu, **G.-W. Chern**, O. Tchernyshyov, X. Zhu, J. Zhu, C.-L. Chien, *Magnetic bistability and controllable reversal of asymmetric ferromagnetic nanorings*, Phys. Rev. Lett. **96**, 027205 (2006); cond-mat/0508249. Featured in the January 17, 2006, issue of Virtual Journal of Nanoscale Science & Technology.
38. O. Tchernyshyov and **G.-W. Chern**, *Fractional vortices and composite domain walls in flat nanomagnets*, Phys. Rev. Lett. **95**, 197204 (2005); cond-mat/0506744. Featured in the November 3, 2005, issue of Virtual Journal of Nanoscale Science & Technology.

## B. Optics and Nano-acoustics:

39. Y.-C. Wen, **G.-W. Chern**, K.-H. Lin, J. J. Yeh, and C.-K. Sun, *Femtosecond optical excitation of coherent acoustic phonons in a piezoelectric p-n junction*, Phys. Rev. B **84**, 205315 (2011).
40. K.-H. Lin, **G.-W. Chern**, C.-T. Yu, T.-M. Liu, C.-C. Pan, G.-T. Chen, J.-I. Chyi, S.-W. Huang, P.-C. Li, C.-K. Sun, *Optical piezoelectric transducer for nano-ultrasonics*, IEEE Transactions on Ultrasonics, Ferroelectrics and Frequency Control, **52**, 1404 (2005).
41. K.-H. Lin, **G.-W. Chern**, Y.-K. Huang, C.-K. Sun, *Terahertz electron distribution modulation in piezoelectric  $In_xGa_{1-x}N/GaN$  multiple quantum wells using coherent acoustic nanowaves*, Phys. Rev. B **70**, 073307 (2004). Featured in the August 19, 2004, issue of Virtual Journal of Ultrafast Science.
42. S.-W. Chu, S.-Y. Chen, **G.-W. Chern**, T.-H. Tsai, Y.-C. Chen, B.-L. Lin, C.-K. Sun, *Studies of  $\chi^{(2)}$ / $\chi^{(3)}$  tensors in submicron-scaled bio-tissues by polarization harmonic generation microscopy*, Biophys. Journal **86**, 3914 (2004).
43. **G.-W. Chern**, K.-H. Lin, C.-K. Sun, *Transmission of light through quantum heterostructures modulated by coherent acoustic phonons*, J. App. Phys. **95**, 1114 (2004). Featured in the February 2, 2004, issue of Virtual Journal of Ultrafast Science.
44. **G.-W. Chern**, C.-K. Sun, G. Sanders, C. J. Stanton, *Generation of coherent acoustic phonons in nitride-based semiconductor nanostructures*, in *Ultrafast Dynamical Processes in Semiconductors*, edited by K.-T. Tsen, Topics in Applied Physics, Vol. **92** (Springer-Verlag, 2004).
45. **G.-W. Chern**, C.-K. Sun, Y.-K. Huang, K.-H. Lin, *Generation of coherent acoustic phonons in piezoelectric semiconductor heterostructures*, Proceedings of SPIE **4992**, 226 (2003); cond-mat/0301031.

46. **G.-W. Chern**, K.-H. Lin, Y.-K. Huang, C.-K. Sun, *Spectral analysis of high harmonic coherent acoustic phonons in piezoelectric semiconductor multiple quantum wells*, Phys. Rev. B **67**, 121303(R) (2003). *Featured in the March 19, 2003, issue of Virtual Journal of Ultrafast Science.*
47. C. J. Stanton, G. D. Sanders, R. Liu, **G. W. Chern**, C. -K. Sun, J. S. Yahng, Y. D. Jho, J. Y. Sohn, E. Oh, D. S. Kim, *Coherent phonons, nanoseismology and THz radiation in InGaN/GaN heterostructures*, Superlattices and Microstructures **34**, 525 (2003).
48. K.-H. Lin, **G.-W. Chern**, Y.-C. Huang, C.-K. Sun, *Observation of huge nonlinear absorption enhancement near exciton resonance in GaN*, Applied Physics Letters **83**, 3087 (2003). *Featured in the November 2003 issue of Virtual Journal of Ultrafast Science.*
49. C.-K. Sun, **G.-W. Chern**, K.-H. Lin, Y.-K. Huang, *Observation of large acoustic gain in coherent acoustic phonon oscillators*, Chinese Journal of Physics **41**, 643 (2003).
50. T.-M. Liu, Y.-C. Huang, **G.-W. Chern**, K.-H. Lin, C.-J. Lee, Y.-C. Hung, C.-K. Sun, *Characterization of ultrashort optical pulses with third-harmonic-generation based triple autocorrelation*, Journal of Quantum Electronics **38**, 1529-1535 (2002).
51. K.-H. Lin, **G.-W. Chern**, S.-W. Chu, C.-K. Sun, H. Xing, Y. Smorchkova, S. Keller, U. Mishra, S. P. DenBaars, *Ultrashort hole capture time in Mg-doped GaN thin films*, Applied Physics Letters **82**, 3975-3977 (2002). *Featured in the November 2002 issue of Virtual Journal of Ultrafast Science.*
52. Y.-C. Huang, **G.-W. Chern**, K.-H. Lin, J.-C. Liang, C.-K. Sun, C.-C. Hsu, S. Keller, S. P. DenBaars, *Femtosecond dynamics of exciton bleaching in bulk GaN at room temperature*, Applied Physics Letters **81**, 85-87 (2002). *Featured in the July 2002 issue of Virtual Journal of Ultrafast Science.*
53. T.-M. Liu, Y.-C. Huang, **G.-W. Chern**, K.-H. Lin, C.-J. Lee, Y.-C. Hung, C.-K. Sun, *Triple-optical autocorrelation for direct optical pulse-shape measurement*, Applied Physics Letters **81**, 1402-1404 (2002). *Featured in the September 2002 issue of Virtual Journal of Ultrafast Science.*
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60. **G.-W. Chern** L. A. Wang, *Design of binary long-period fiber grating filters by the inverse-scattering method with genetic algorithm optimization*, Journal of Optical Society of America A **19**, 772-780 (2002).
61. **G.-W. Chern**, L. A. Wang, C.-Y. Lin, *Transfer-matrix approach based on modal analysis for modeling corrugated long-period fiber gratings*, Applied Optics **40**, 4476-4486 (2001).
62. **G.-W. Chern**, L. A. Wang, *Analysis and design of almost-periodic vertical-grating-assisted codirectional coupler filters with nonuniform duty ratios*, Applied Optics **39**, 4629-4637 (2000).
63. **G.-W. Chern**, L. A. Wang, *Transfer-matrix method based on perturbation expansion for periodic and quasi-periodic binary long-period gratings*, Journal of Optical Society of America A **16**, 2675-2689 (1999).